ATLAS WATER-TUBE BOILERS

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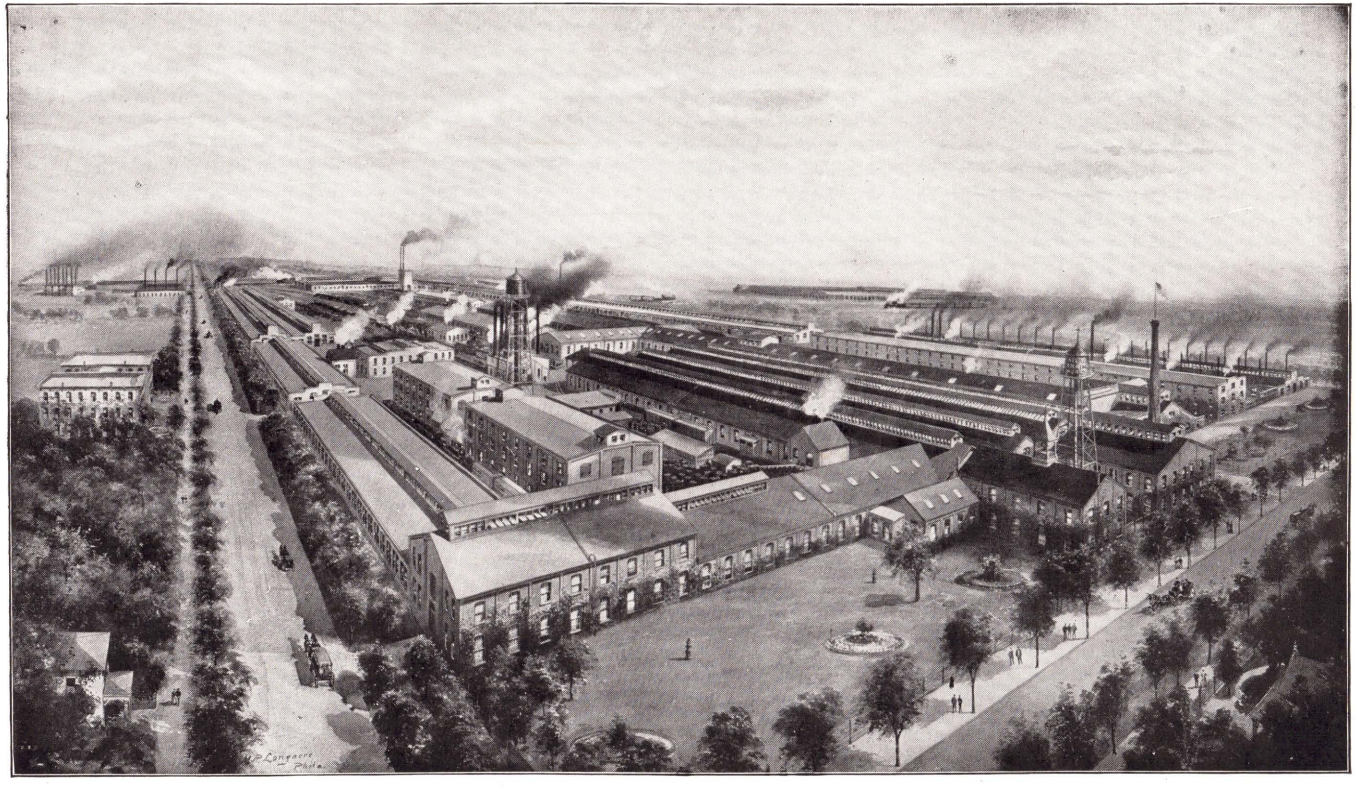

THE WORKS

ATLAS ENGINE WORKS

BUILDERS OF

ENGINES AND BOILERS

OF QUALITY

No. 127

INDIANAPOLIS, INDIANA, U. S. A.

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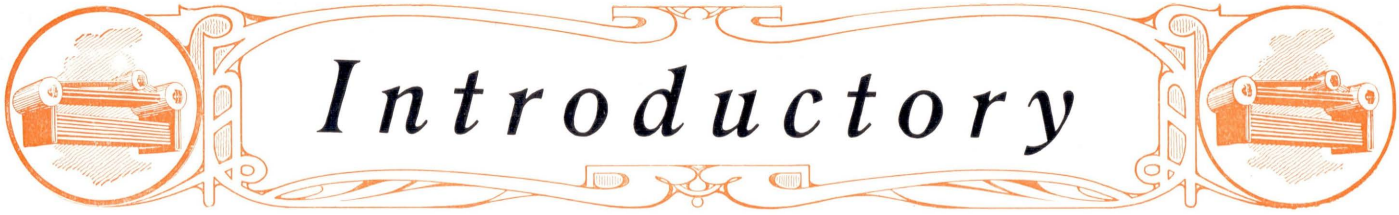


Introductory

THE Atlas Water-Tube Boiler is built on absolutely correct principles without a single compromise for any reason whatever. It is the logical Water-Tube Boiler. The cost of production is greater and the price often higher than that of Boilers not so thoroughly and carefully designed and constructed, but when the original purchase price is summed up with the cost of fuel, attendance and repairs, to say nothing of the difference in the number of days of possible service annually, the net result as compared to any other Water-Tube Boiler will show a balance in favor of the Atlas.

The purpose of this little book is to tell in a simple straightforward way the story of the Atlas Boiler and to point out the relative values of some of the characteristic features which entitle it to the favorable consideration of intending purchasers.

ATLAS ENGINE WORKS,

INDIANAPOLIS, INDIANA.

Safety, Durability, Economy, Accessibility.	Efficiency, Combustion, Superheated Steam, Capacity.	Unimpeded Circulation, Universal Flexibility, Simplicity.

Atlas

Water-Tube Boilers

Excel

In All These Qualities.

Feed-Water Purification, Cleaning Facilities, Heat Absorption.	Freedom from Soot and Scale Deposits, Quick Generation, Free Liberation.	All Wrought and no Cast Metals, Continuity of Service, Surplus Strength.

Range of Sizes

These Boilers are built in standard units of 100, 125, 150, 175, 200, 225, 250, 300, 350, 400 and 450 horse power and are, of course, susceptible of battery combinations to reach any desired total.

General Design

The Atlas Boiler is built on simple straight lines. It consists mainly of three drums and two water-legs extending crosswise and the tubes running lengthwise; thus all tube surfaces run in one direction and all plate surfaces in another, producing universal flexibility and the avoidance of the unfortunate results oft-times experienced from unequal expansion and contraction as between the thin tubes and the thick plates of drums when both tubes and drums run lengthwise. That the longitudinal expansion and contraction is uniform and general throughout the entire width and height of this Boiler has been definitely established by actual measurements taken at top and bottom before firing and again after full working pressure has been reached. The expansion and contraction of the tubes is well taken care of by mounting the rear water-leg on rollers, thus effectually preventing injury or danger from these stresses.

An important and original feature in the general design is that the water-legs are formed by the continuation of the plates of which the shells of the front and rear drums are composed. Thus no flanged plates or riveted seams whatever are exposed either to the fire or hot gases at any point. The value of this form of construction lies in the fact that it eliminates the possibility of the crystalization of plates and rivets and consequent cracks and annoying leaks at the seams arising from overheating and unequal expansion and contraction of double metal thickness, due to exposure to flames and furnace gases of high temperature.

Another exclusive and very valuable feature of the design is the arrangement for passing the steam, after leaving the vessels containing water, through a series of superheating tubes, wherein it loses every particle of moisture and is heated to a temperature many degrees higher than that normal to its pressure.

Attention is directed to the fact that no matter how large the Boiler, there is only one steam drum, consequently the entire product of the Boiler can be piped out of a single steam opening. This means a large saving in the cost of piping when compared to the expense incident to installing other types of Boilers, which in units of say 200 horse power, or larger, necessarily have two longitudinal drums to be connected together by the purchaser.

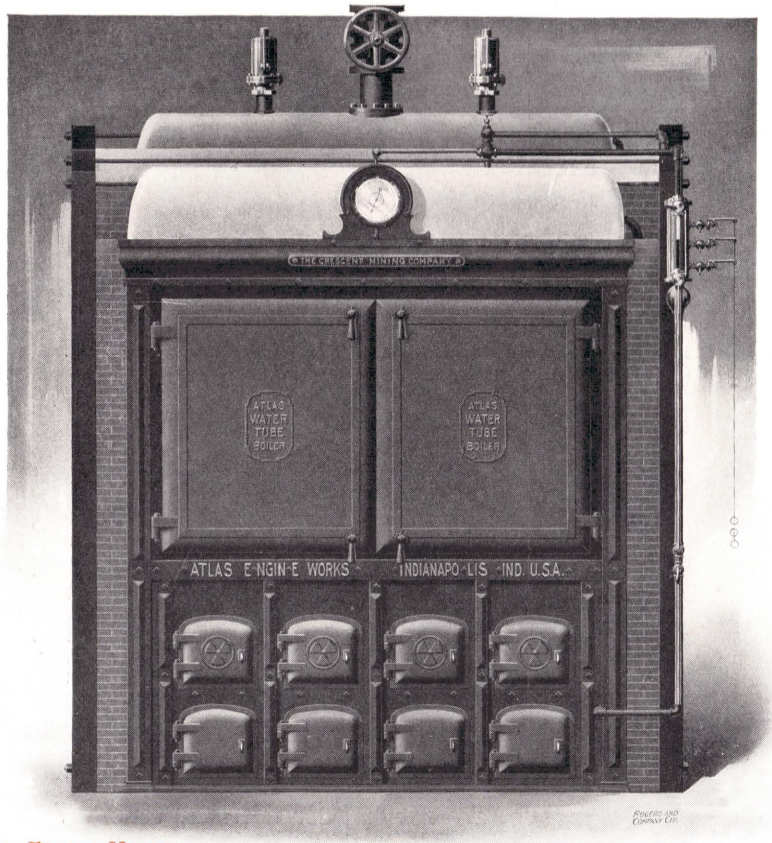
All parts of the Atlas Boiler and the fixtures furnished are designed for a safe working pressure of 160 pounds per square inch with a safety factor of more than 5.

Materials and Workmanship

All materials have been selected with especial reference to their adaptability to the service required. The shells and heads of the drums and water-legs are open hearth homogeneous flange steel, bearing the maker's stamp of 60,000 pounds tensile strength per square inch of section, with not less than 50 per cent of ductility as indicated by contraction of area at point of fracture under test; an elongation of 25 per cent in a length of 8 inches, and guaranteed by the makers to be capable of bending down flat upon itself when cold, red hot or after being heated to a cherry red and quenched in cold water, without sign of fracture. The chemical and physical properties are determined by thorough tests and all plates must meet the requirements of the best accepted practice.

The tubes are standard American lap welded, thoroughly tested in all particulars before being expanded into place by roller expanders and again after the Boiler is assembled. The tube-holes are accurately placed by template, then reamed and neatly chamfered.

Double-refined iron staybolts and braces, having an ultimate tensile strength of 52,000 pounds per square inch of section, an elastic limit of at least half the tensile strength and an elongation of eighteen per cent in a length of 8 inches, are set to bear uniform tension.



IN MASONRY—FRONT VIEW

The rivets are of mild steel and can be bent over cold till the sides meet, without developing cracks on the outsi e of the bent portion. All rivet holes are reamed to perfect fairness and the riveting wherever practicable is done by hydraulic machinery, upsetting the rivet its full length, completely filling the hole and forming a perfect head in line with it. There are no riveted seams in the fire or in the path of the furnace gases.

All heads are first heated to a uniform bright red and then flanged at a single operation in a hydraulic flanging press. The bends in the plates forming the bottoms of the water-legs are pressed cold under heavy pressure. There is no distortion, either of heads or plates and there is a total absence of marks resulting from frequent and partial heating and hammering into shape.

No cast metals are used in any parts that are subjected to tensile stresses or furnace heat. The cast iron that is used for handhole and manhole plates and yokes is good, soft, grey iron, free from flaws or imperfections.

Round-nosed tools operated at high speed by pneumatic pressure are used to caulk all seams.

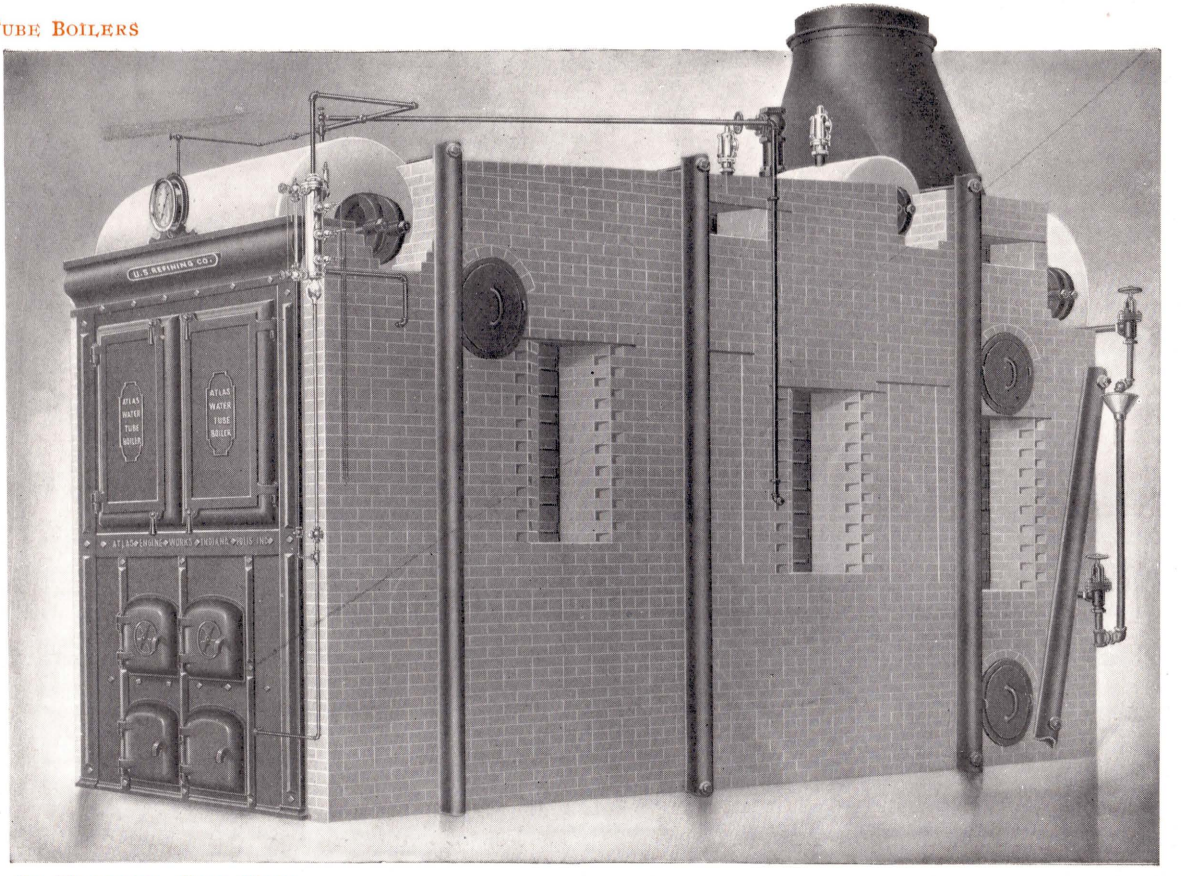
The drums and water-legs are tested under 240 pounds hydrostatic pressure and made tight at that pressure and when the Boiler is assembled at the Works this pressure is applied a second time.

Rating

The generally accepted Centennial Standard of horse power which calls for the evaporation of 30 pounds of water per hour at 70 pounds pressure from a feed-water temperature of 100 degrees, or an evaporation of 34½ pounds of water from a feed-water temperature of 212 degrees into steam of the same temperature, is adopted as the basis for all calculations. To accomplish this evaporation 10 square feet of heating surface are allowed for each horse power for most economical practice. This is a liberal allowance for Boilers of this class as experience has demonstrated that under favorable conditions a horse power can be developed with 7½ square feet of heating surface without injuring the Boiler or seriously impairing its economy and it follows that the actual capacity of this Boiler is much greater than the nominal rating. Then too, the quality as well as the quantity of steam produced has much to do with the real capacity and efficiency of a Boiler. The Atlas Boiler furnishes superheated steam.

Circulation

The rapid, steady, unimpeded flow of the water in the course natural to expansion by exposure to heating surface, bears important relation to the most economical utilization of the heat units



In Masonry—Side View

drum, where the globules of steam generated in the tubes are liberated and carried through the superheating tubes to the steam drum. Meanwhile the water continues its flow through the equalizing tubes to the rear drum, joining the feed current at that point. The regular movement of all the water in the circuit just described, indicates uniform temperature in all the water-tubes and when an unimpeded circuit has been established in the manner just explained, a maximum supply of dry steam will be delivered. When the circulation is retarded to sluggishness, the water does not so readily absorb the heat and wet steam and a smaller quantity of it must be expected. It will be noted that while the design of this Boiler admits with equal facility the use of either the vertical or the horizontal flame travel, the illustrations herewith show the vertical, it being preferred for several reasons, not the least important of which is that a more uniform distribution of the heat arising from the grates is obtained by first passing the gases upward through the entire nest of tubes between the front end of the furnace and the first vertical baffle, thence downward between the first and second baffles and finally upward again through the entire nest of tubes between the second baffle and the rear water-leg. It is not difficult to understand that, aside from all other considerations, the course of the heated gases as described is conducive to a more nearly equal division of the units of heat among all the water-carrying tubes than is possible with the horizontal travel which concentrates by far the greatest degree of heat on the lowest tubes during almost their

entire length. Uniform heat distribution means uniform temperature, which, logically followed, leads to the reasonable belief that the circulation, which increases or decreases as the temperature goes up or down, is of regular direction in all the tubes, and that each tube is doing its full share of the work and that neither sluggishness nor conflicting currents exist in any of the tubes. That these are the actual conditions in this form of Boiler and with the vertical flame travel has been proved by exhaustive experiments made by inserting thermometers and small turbine wheels into the tubes of the several horizontal rows and ascertaining the relatively similar temperature and speed of the water in the entire bank of tubes, while quite the reverse has been found to exist in the case of Boilers set with the horizontal baffle.

Next to safety, proper circulation is the item of greatest importance in designing a Boiler for greatest efficiency, and the splendid success of the Atlas Boiler in service is a gratifying return for the effort and expense that have been devoted to the development of this feature.

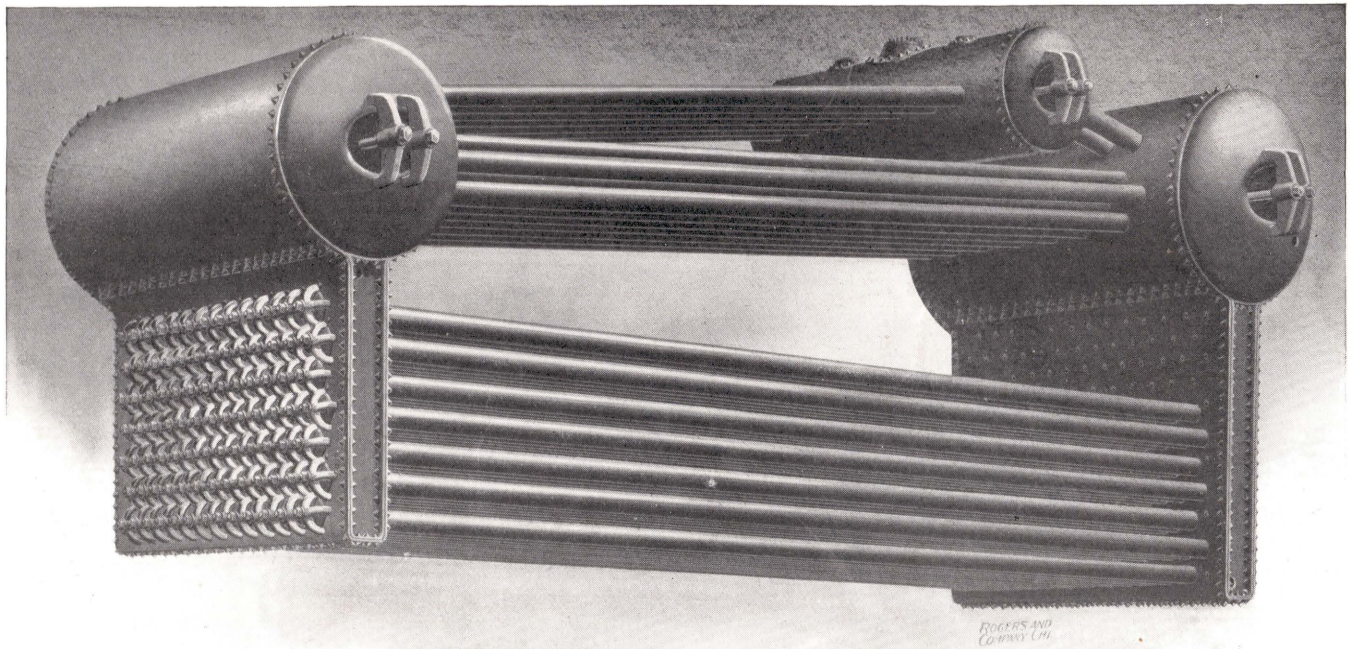
Superheated Steam

This valuable product has of late years been the subject of much thought and experiment and now the economical utility of steam containing a number of degrees of superheat is quite generally

understood. Ordinary steam at 100 pounds gage pressure has a normal temperature (omitting fractions) of 338° F. and at 160 pounds its normal temperature is 370° F. The temperature in excess of normal for steam of a given pressure is technically designated superheat. Steam that is in contact with water cannot be heated above the temperature normal to its pressure. The process of superheating must, therefore, take place subsequent to the passage of the steam from the vessels containing water. Superheat is obtained by exposing steam to gases of higher temperature. The number of degrees of superheat obtainable is governed by the temperature of the gases to which the steam is exposed and the duration of exposure. During various tests under actual working conditions Atlas Water-Tube Boilers have produced steam containing from 10 to 30 degrees of superheat.

The first 20 degrees of superheat are relatively more valuable than further superheat, partly because the specific heat of steam appears to be lower nearer the saturation point and partly because the first useful effect of superheat is to counteract the loss due to cylinder condensation resulting from the cooling of surfaces during the emission of exhaust and also because no matter how little the superheat, at least dry steam in the steam chest of the engine is absolutely assured, which is not possible when merely saturated steam is delivered by the Boiler.

No other design of horizontal Water-Tube Boiler on the present market can furnish superheated steam unless equipped with special auxiliary apparatus supplied only upon specific order

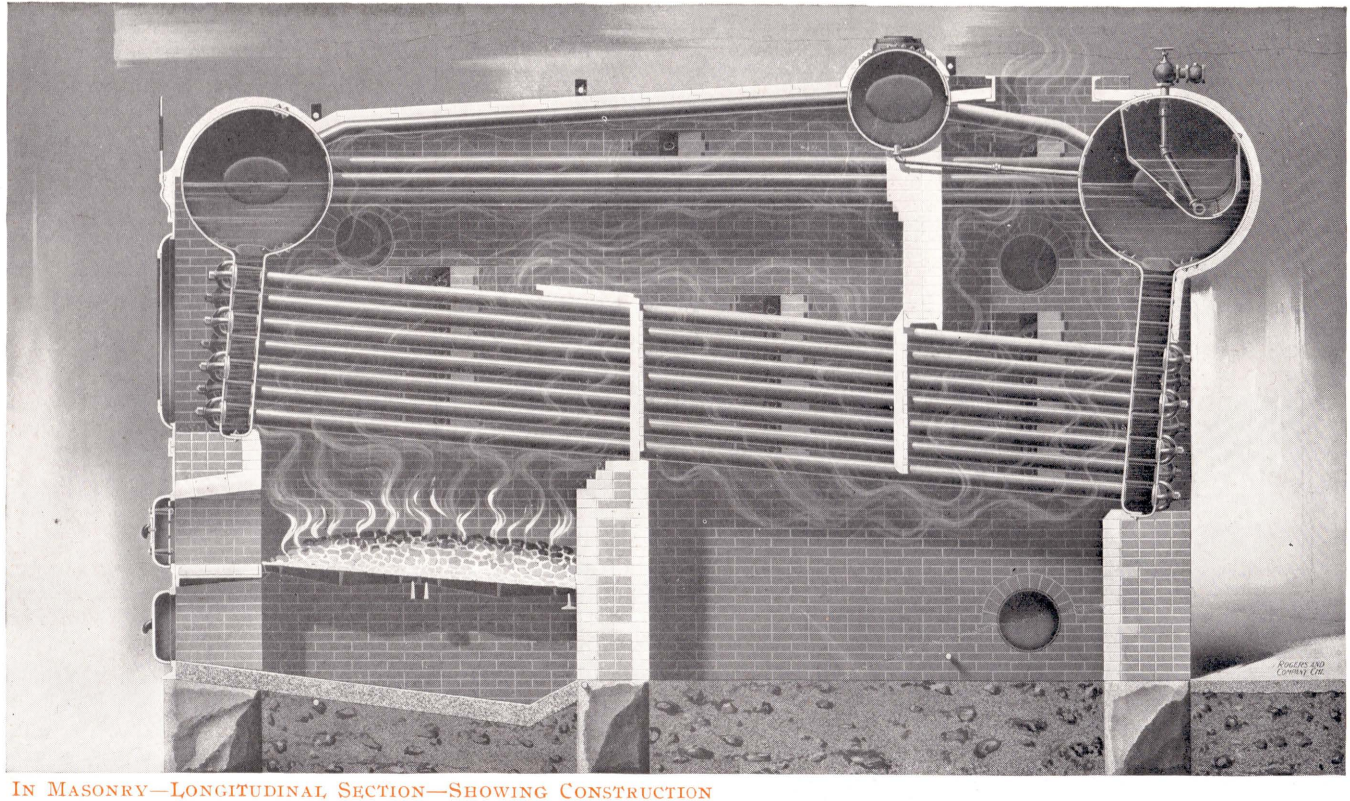


Ready to be Skidded for Shipment

and at heavy additional cost. This is so because the steam in every case, except that of the Atlas Boiler, is delivered out of a drum half-full of water in a violent state of agitation. The tendency of the rising vapor in such Boilers is to carry away with it a considerable quantity of moisture from the surface of the water, especially when the demand upon such Boilers is so severe as to take the steam as fast as it can be generated. In other words, such Boilers when crowded must, in the nature of things, furnish wet steam. The Atlas is the only horizontal Water-Tube Boiler in which after the steam has left the drums containing water, it is subjected to gases of higher temperature and absorbs superheat on the way to the steam drum. It will be observed that while the superheating tubes of the Atlas Boiler are located at a point where the temperature is sufficiently high to afford a very satisfactory degree of superheat, yet they are outside of the direct course of the flames and gases from the furnace and there is no danger of overheating the tubes.

All users of steam are familiar with radiation losses in steam pipes and the wastes in engine cylinders due to the fact that at each stroke the new supply of steam is brought into contact with the face of the piston and the internal surfaces of the cylinder, which have been cooled by the exhaust of the previous stroke. When steam is used at normal temperature, each degree of heat thus lost, means condensation and a proportional decrease of pressure. When superheated steam is used there is no loss of pressure until the steam is cooled to the temperature normal to the Boiler pres-

second place, the mud drum proved in many cases little short of an aggravation by reason of the constant and irremediable leakage of the joints between the drum and Boiler, due to the greater expansion and contraction of the Boiler, the drum being necessarily situated outside of the current of the hottest gases. Live steam purifiers and other substitutes have been in vogue for years, most of which possess merit in excess of the cost of installation and maintenance in operation, which, however, it must be said, is frequently an item of grave importance. In the Atlas Boiler the annoyance and inefficiency of the mud drum and the expense of a separate live steam purifier are dispensed with, mud and other scale-forming sediment being very efficiently extracted by passing the feed-water through a simple and inexpensive purifying reservoir contained in the Boiler itself. The sectional views of the Boiler show this reservoir to be in the form of an open-topped semi-cylindrical pan with closed ends, hung loosely by strap-hooks from the shell of the rear water drum, its depth gradually increasing toward the blow-off end. The water is fed into the shallow end and, the pan being large and always full of and surrounded by hot water and steam, it is raised to from 250° to 275°F. before it overflows into the main portion of the drum. The overflow takes place entirely at the shallow end of the pan, the top of that head being one inch lower than the other head and the sides. It is a well known fact that water begins to clear itself when it reaches a temperature of 200°F., and as the liberal dimensions of the pan allow the



In Masonry—Longitudinal Section—Showing Construction

water to remain in it a considerable time, practically all the scale-forming impurities are precipitated to the bottom of the pan where they remain in a soft sludge-like state pending the opening of the blow-off valve, the frequency of which should be governed by the character of the water and the rapidity of the accumulation.

It will be noted that aside from its open top, which is several inches above the water line in the Boiler, the pan is water-tight. It is entirely practicable, therefore, to blow off the sediment as often as desirable while the Boiler is under pressure without fear of reducing the water level below the point of safety.

Corrosion is one of the inevitable effects of the accumulation of mud and sediment on metal. Unlike purifiers common to some other Boilers, which consist of a pocket-shelf built against the shell or one head of the Boiler itself, which, therefore, forms part of the purifier and is exposed to the corrosive action of its contents, the purifier in the Atlas Boiler is self-contained and absolutely independent of the Boiler-shell or heads. The pan is made in sections and when it finally deteriorates to an unserviceable point, can be removed and replaced through the manhole with little labor and small expense.

It is estimated that an incrustation of $\frac{1}{16}$-inch will cause a loss of 13 per cent of fuel, ⅛-inch 25 per cent and so on, and these figures are probably not far from correct. Therefore,

the purification of the feed-water before it reaches the surfaces exposed to the baking heat of the furnace tends to a more economical use of fuel. It also reduces cleaning labor and the cost of repairs and increases the life of the Boiler by avoiding the early disintegration of the metal which results from subjecting it to that intense heat necessary to boil water through the additional thickness due to a coating of scale.

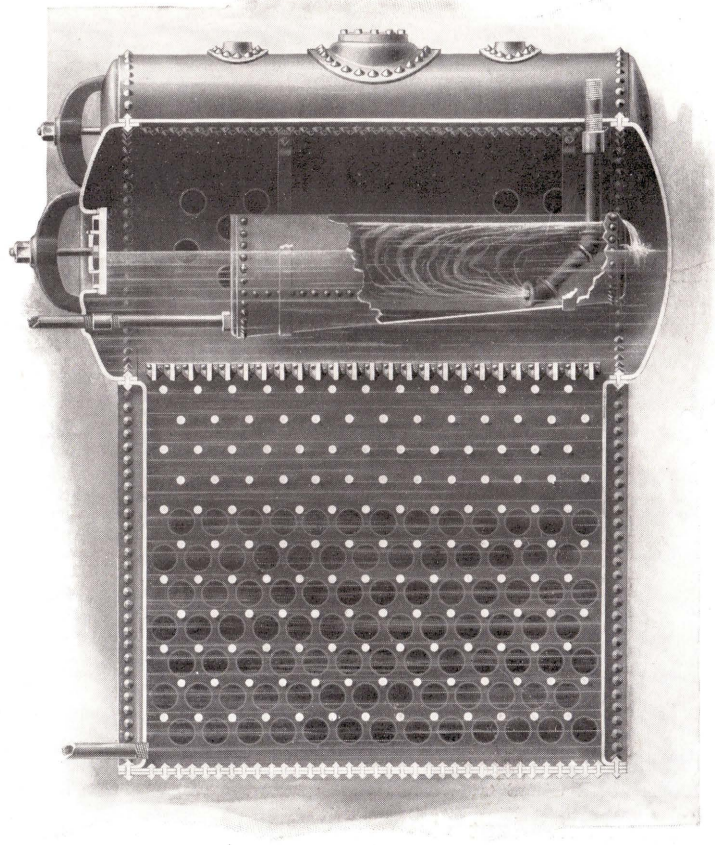
Accessibility for Cleaning

Very effective means having been provided for purification of the feed-water, it would appear that ordinarily little occasion should exist for getting at the internal surfaces, yet the Atlas Boiler is so constructed that every inch of it is within easy and convenient reach for cleaning, both inside and out. An individual handhole is located opposite each end of each water-tube. The handholes are of the diamond-oval shape and each is provided with an accurately fitted plate, held in position by a suitable yoke with bolt and nut, the construction being such that the pressure on the inside of the Boiler maintains the tightness of the joint. A distinctive feature is that any one of these plates can be removed and replaced through its own opening without disturbing any of the others.

The water-tubes in this Boiler are absolutely straight, as water-tubes should always be, and

in order to clean them thoroughly on the inside, it is only necessary to remove the front handhole plates, insert a scraper and push the sediment back into the rear water-leg, removing it therefrom through a few of the handholes in the bottom row or through the blow-off. When it is desired merely to wash out the water-tubes, it may be very thoroughly done without disturbing any of the handhole plates, as the mouth of each inclined tube may be reached with a piece of curved pipe attached to a water hose and held through the full-length throat at the front end. The internal condition of each water-tube may be determined without removing any of the rear handhole plates, by suspending a light through the full-length throat between the rear water-leg and drum and holding it in turn opposite the rear end of each water-tube, while looking through the open handholes at the front end. Or if the attendant prefers, the top row of handhole plates may be removed and the light inserted and suspended through the upper handholes without entering the drum. Such convenient inspection is out of the question with Boilers having bent or curved tubes, or Boilers having the throats drawn in to meet the circle of the upper drum, in conjunction with round handholes.

A notable and important feature of the type of Boilers having two vertical water-legs connected by a nest of water-tubes, the ends of which are commanded by a series of handholes is that in cleaning the water-tubes, the attendant stands in a natural position outside the Boiler and the



Section Through Rear Drum and Water-Leg, Showing Purifier, Etc.

work of cleaning begins as soon as the Boiler is empty. This is in marked contrast to Boilers having bent or curved tubes. In the latter case, by reason of the bends, the interior surfaces of the tubes are not susceptible of inspection and the manipulator of the tube cleaner must work inside the drums in a cramped awkward position. It is obvious, too, that the cleaning cannot begin until several hours after the fire has been drawn as time must be allowed for the Boiler to cool before it can be entered.

The interior of each of the three cross drums of the Atlas Boiler is reached through a large manhole in one end. The edge of this manhole forms a deep flange at right angles with the head, is faced true and provided with an accurately fitted plate with yokes, bolts and nuts, all of such proportions that this part of the head is as strong as any other of like area.

Owing to the manner in which the furnace gases are sent three times against and between the staggered rows of tubes, the temperature in the smoke uptake is but little in excess of the temperature of the steam, the highest practicable percentage of the total units of heat being absorbed by the water in the tubes and perfect combustion is secured. Nearly all of the dust and soot settles in the large combustion chamber, back of the bridge wall, but such as settles upon the tubes is readily dislodged and driven to convenient points for removal by means of jets of superheated steam issuing from orifices in the end and around the circumference of a blower which forms a part of the

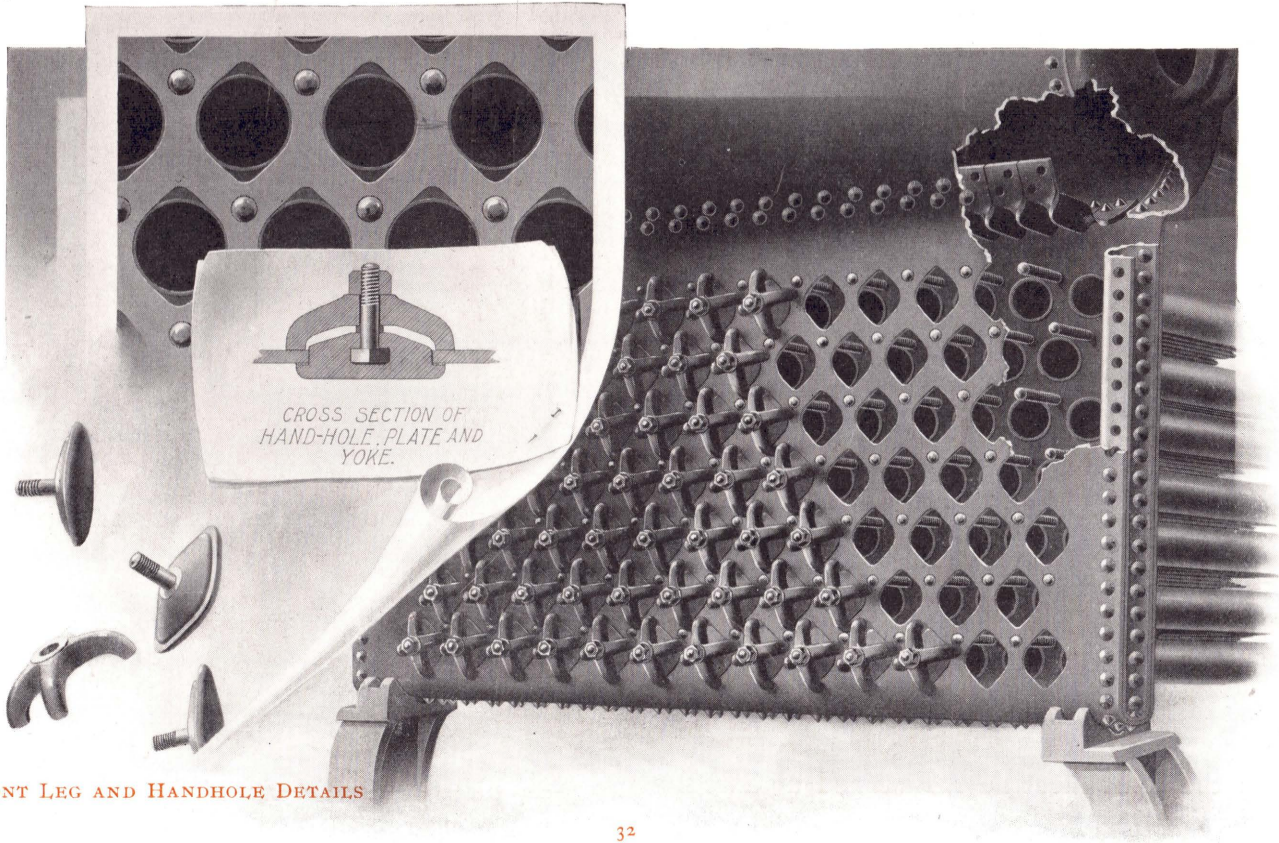
regular Boiler equipment. Superheated steam, closely resembling compressed air at high pressure, and containing absolutely no moisture, is a most effective agent for the dislodgement of soot, and far superior to ordinary saturated steam which often merely dampens the soot and causes it to adhere to the tubes with greater tenacity, resulting in diminished efficiency of heating surface and early corrosion of the metal. The side view of the setting as illustrated in this book, shows the doors through which the steam blower is introduced while the Boiler is in operation and without the admission of cold air into the furnace. It will be noted that the superheating tubes and the equalizing tubes are reached by two cleaning doors near the top of the setting, while the water-tubes are commanded between each of the vertical baffle walls, by a series of small sliding panels opening the way to the spaces between each of the horizontal rows of tubes. The three large round doors shown on the same picture afford entrance to the interior of the setting for purposes of inspection and outlet for the removal of soot and dust. These complete the arrangements for cleaning.

Handholes, Replacement and Removal

It has been said in a preceding paragraph that the Atlas handholes are made of the diamond-oval shape in order that each plate may be removed and replaced through its own opening without disturbing any of the others. The value and importance of this feature will be

appreciated when due consideration has been given to the following facts. Certain manufacturers furnish round handholes and plates simply and solely because it costs less to punch and finish a round hole than any other shape in heavy steel plate. The Boiler manufacturer's gain in this respect is the user's loss as the round plates cannot be taken out or put back through their own openings and for that purpose several of the openings near the bottom are made oval. The annoyance and loss of time by reason of the necessity of dropping all of the plates down to the bottom of the water-legs and laboriously working them up again, hand over hand, between the staggered staybolts while reaching in through the several holes, one above the other, are appalling to contemplate. It should be remembered, too, that with such a round-hole system, if it is desired to open up merely the upper handholes, all the joints directly below the plates that are removed, must be broken to permit of reaching in to work the upper plates back into place.

Certain other manufacturers who limit themselves to round handholes on sectional headers of a sinuous form, which practically prohibits dropping the plates down to be removed through oval holes at the bottom, resort to a practice that is infinitely worse, namely, the fitting of the plates on the outside of the header, the yoke being on the inside, which means that the joint must be maintained against the pressure in the Boiler by means of tension on



Front Leg and Handhole Details

the thread and bolt. If the hole is 4⅛ inches in diameter and the pressure in the Boiler 160 pounds per square inch, the strain on the threads if drawn up only tight enough to counterbalance the Boiler pressure, would be 2,137 pounds, but it must be at least enough more than that to take care of the stretch of the bolt and keep the joint tight after the steam has been raised and since the joint must be made while the Boiler is cold, the additional strain necessary is a matter of guesswork. It is unsafe to tighten up on the bolt with pressure in the Boiler, for the reason that in the event of the cracking of the nut, snapping of the bolt, or stripping of the threads the manipulator of the wrench could not escape a scalding; hence the tendency, in the effort to make sure of a tight joint, is to put considerably more tension on the bolt than necessary. The strain is on the bolt continuously whether steam is on or not, and every now and then a bolt or a nut gives way, resulting in the shut-down of the plant and sometimes serious injury to the attendants. In the Atlas Boiler each diamond-shaped handhole plate measures 4⅞ x 5⅞ inches, which means that with 160 pounds pressure in the Boiler, the plate is being held in its proper position and the joint is being maintained by a pressure of 4,582 pounds on the back of the plate. Thus it will be seen that the office of the bolt and nut is really little more than to hold the plate properly in position when there is no pressure in the Boiler and the nut need only be screwed up tight enough for that purpose.

Still other manufacturers furnish handhole plates, each of which is large enough to cover the ends of two tubes and claim that in this way the labor of opening up and closing the Boiler is reduced to one-half that necessary in the case of a handhole for each tube. The practical man knows that several small handhole plates can be removed and replaced in the time required for one manhole plate.

The additional safety and convenience of the Atlas handhole system have been carefully weighed against its cost over and above the several round handhole and other cleaning systems and it has been adopted in the belief that its superior value will continue to appeal to the thinking purchaser long after the reduction of manufacturer's profit on the individual sale has been forgotten.

Setting and Supports

The setting requires only the most simple and inexpensive masonry, consisting of plain vertical walls and a flat tile roof, supported by the superheating tubes. There is a total absence of troublesome overhanging masonry between or to the drums, common to other types of Boilers.

The Boiler is supported on heavy iron columns and shoes at front and rear, all setting close

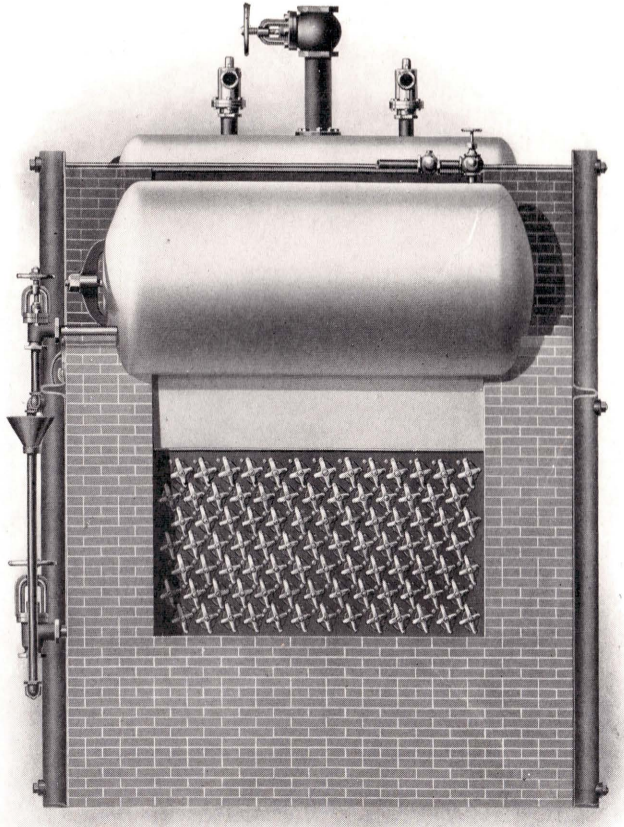
to the ground and entirely independent of the side walls. Plates and rollers under the shoes at the rear adequately care for longitudinal expansion.

By reason of greater stability, stocky undersupports are to be preferred to any form of overhead suspension to which Boilers having long nipple or tube connections between the water-legs and the upper drum are limited. The design of the Atlas Boiler admits of arranging it either for support or suspension at the option of the purchaser.

Direction of Flame Travel

The investigating buyer is apt to be confused by the conflicting claims of the respective advocates of vertical and horizontal baffling. The fact of the matter is that there are several thousands of Boilers in satisfactory daily service with the vertical baffling and probably not one-fourth as many with the horizontal. Unbiased observation and comparative tests prove the preponderance of merit to be with the vertical baffle; first, as to safety and durability; second, as to circulation; third, as to efficiency in heat absorption.

The practice of placing a horizontal tile baffle or deflector between the first and second or the second and third rows of tubes above the grates is viewed with apprehension by the Boiler inspection



In Masonry—Rear View

and insurance companies because in this manner the intense heat of the gases in the roof of the furnace is concentrated upon the few tubes below the baffle. The natural outcome of this condition, borne out by the experience of many users, is the premature, and often untimely, destruction of the lower tubes, which means heavy repair bills, if indeed, nothing worse.

The beneficial effect upon the circulation of water, resulting from uniform division of the heat units among all the water-tubes, as obtained by the vertical flame travel, is fully explained in the chapter on circulation elsewhere in this book.

Each horizontal row of water-tubes in the Atlas Boiler is staggered with relation to the rows immediately above and below; in other words, the tubes in one row are located over the spaces between the tubes of the next lower row. The flames and heated gases first strike the lower half of the circumference of the tubes in the first row, thence passing around each of these tubes they are, by means of judicious spacing, impinged simultaneously against the upper half of the circumference of the first row of tubes and the lower half of the second and so on up, then downward and then upward again in like manner through the entire nest of tubes. A higher percentage of heat absorption is obtained by impinging the gases three successive times against the entire circumference of each tube than is possible by simply allowing them to glide along parallel with and only once the length of each tube as in the case of the horizontal baffle.

An examination of the pictures will disclose the fact that while the Atlas Boiler has no flanged sheets or riveted seams exposed to flames or hot gases when set with either the vertical or the horizontal baffle, all of the Boilers with the long drums running parallel with the tubes, whose makers advocate the horizontal baffle, expose riveted seams to the hot gases even when set with the horizontal baffle, and if such Boilers were set with the vertical baffle, the flames passing upward from the grates would come directly into contact with the double thickness of metal in the wide flanged and riveted seam between the drum and the front water-leg, which practice would be open at least to serious criticism and this is perhaps one of the most potent reasons for the preference on the part of these builders in favor of the horizontal baffle.

Adaptability to Special Locations

The height, width and length of the Atlas Boiler may be increased or decreased within wide limits, to suit peculiar individual requirements.

Castings and Trimmings

The equipment is thoroughly in harmony with the high character of the Boiler.

The Fire Front is of the Ornamental Full Flush Type and presents a handsome, massive

appearance. It is made in sections thus reducing the chance of cracking and by slight modification is adaptable to either the Dutch-oven form of furnace or the installation of any of the mechanical stokers now on the market.

In addition to the Fire Front, each Boiler is regularly furnished with a complete set of grate bars with suitable bearers, cast columns and shoes for support, plates and rollers to go under the rear water-leg, three round soot pit doors and frames and cast cleaning frames for side walls, vertical baffle castings, channels for smoke stack or breeching support, four pairs of buckstays and binder rods, all special tile necessary for standard setting, tool outfit consisting of poker, hoe, slice bar, detachable steam soot blower and steel wrench for header nuts, pop safety valve (one for 175 horse power and smaller sizes, two for 200 horse power and larger sizes), 10-inch double spring steam gage with siphon, combination water column with high and low alarms, lever gage cocks, feed-water check and stop valves and angle blow-off valves with renewable seats for purifier and rear water-leg.

Shipment and Erection

The 250 horse power and smaller Boilers are usually assembled at the Works and shipped on skids complete, ready to be set on the foundation and bricked in. Many railroads, not limited

by tunnels or otherwise, allow sufficient height for shipping also the 300 and 350 horse power Boilers with the tubes in place. The larger Boilers are always shipped with the headers and tubes separate and are put together at destination by simply expanding the tubes into the drums and water-legs. The riveting and stay-bolting on all Boilers is done at the Works before shipment.

In General

Claims of merit have been made only after very thorough demonstration and the absolute superiority of the Atlas Water-Tube Boiler over any steam Boiler in the world is proclaimed unhesitatingly and with full knowledge of the claims and merits of all other builders.